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Primordial Black Holes from First Principles (Overview)[1] CASEY LAM, JOLYON BLOOMFIELD, ZANDER MOSS, MEGAN RUSSELL, STEPHEN FACE, ALAN GUTH, Massachusetts Institute of Technology — Given a power spectrum from inflation, our goal is to calculate, from first principles, the number density and mass spectrum of primordial black holes that form in the early universe. Previously, these have been calculated using the Press- Schechter formalism and some demonstrably dubious rules of thumb regarding predictions of black hole collapse. Instead, we use Monte Carlo integration methods to sample field configurations from a power spectrum combined with numerical relativity simulations to obtain a more accurate picture of primordial black hole formation. We demonstrate how this can be applied for both Gaussian perturbations and the more interesting (for primordial black holes) theory of hybrid inflation. One of the tools that we employ is a variant of the BBKS formalism for computing the statistics of density peaks in the early universe. We discuss the issue of overcounting due to subpeaks that can arise from this approach (the cloud-in-cloud problem).

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Casey Lam
Massachusetts Institute of Technology

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